

II. WOODLAND

II.A.4.N.a. Rounded-crowned temperate or subpolar needle-leaved evergreen woodland

II.A.4.N.a.39. PINUS ARISTATA WOODLAND ALLIANCE

Bristlecone Pine Woodland Alliance

PINUS ARISTATA / FESTUCA ARIZONICA WOODLAND

Bristlecone Pine / Arizona Fescue Woodland

ELEMENT CONCEPT

GLOBAL SUMMARY: This is an association confined to exposed, wind-swept ridges and steep slopes in the upper montane and subalpine zones of the southern Rocky Mountains. These open to moderately closed woodlands occur on all aspects, but are most common on drier south- and west-facing slopes. Slopes are typically moderate to steep, but may also be gentle. Soils are typically well-drained, shallow, and skeletal. Stands have an open to moderately closed canopy typically 5-15 m tall that is solely dominated or codominated by *Pinus aristata*. Individual trees may reach 20 m. In some stands trees are clumped with grassy patches interspersed. Other tree species that may be present to codominant vary geographically within its range. *Picea engelmannii* and *Pseudotsuga menziesii* are the most common. *Pinus flexilis* has also been reported as an associate in some stands. *Abies lasiocarpa* and *Populus tremuloides* may be scattered in some stands, but are generally restricted to more mesic sites and are typically absent in the drier southern extent of this association. The understory vegetation ranges from moderately dense to sparse (typically) because sites are dry and often have large amounts of rock cover. The sparse to moderately dense herbaceous layer often dominates the understory. The most common species are typically graminoids, especially species of *Festuca*. This association differs from the *Pinus aristata* / *Trifolium dasyphyllum* Woodland [CEGL000762] by having a higher and more consistent cover of perennial grasses.

ENVIRONMENTAL DESCRIPTION

USFWS Wetland System: Upland

Florissant Fossil Beds NM Environment: These woodland stands occupy steep, erosive slopes (22–28%) that are at least partially composed of volcanic rock and soil weathered from volcanic rock. The soils are a gritty, silty clay under the stand on Fossil Stump Hill and gravelly under the eastern stand. Stands of bristlecone pine grow from the toeslope to the slope shoulder, where they intermix with *Pinus ponderosa* and *Pseudotsuga menziesii*. The slope exposure is predominantly west to northwest (255–310 degrees), and the elevation is approximately 8350 feet for the two stands known in the monument.

Global Environment: This woodland association occurs on semi-xeric sites in the subalpine zone in the southern Rocky Mountains. Elevations range from 2600-3670 m (8500-12,050 feet). Climate is semi-arid, cold temperate with cool summers. Annual precipitation patterns and amounts vary with latitude, but locally the sites are typically xeric on exposed, wind-swept rocky slopes and ridges. These open to moderately closed woodlands occur on all aspects, but are most common on drier south- and west-facing slopes. Slopes are typically moderate to steep, but may also be gentle. Soils are typically well-drained, shallow, skeletal and coarse-textured such as gravelly, sandy loams or loams. Stands occur most frequently on igneous, metamorphic and volcanic substrates such as andesite, granite, gneiss, breccia, tuff, conglomerate, but also occur on sedimentary rocks like sandstone. Exposed bedrock is common. Soil pH is 4.5-6.9, acid to slightly acid.

VEGETATION DESCRIPTION

Florissant Fossil Beds NM Vegetation: Two stands are dominated by *Pinus aristata* / *Festuca arizonica* Woodland within the monument and are characterized by canopy trees that are approximately 15 m in height and subcanopy trees to approximately 10 m tall. The stand on Fossil Stump Hill occupies much drier soils and is located on a physically smaller hill than the eastern stand, consequently, it is more depauperate in terms of understory species. The largest *Pinus aristata* tree recorded for a sampling plot on Fossil Stump Hill measured 61.6 cm dbh, and the largest tree in the easternmost stand measured 33.7 cm. Both stands are reproducing, with seedling and sapling *Pinus aristata* trees present on the slopes. Some trees were showing chlorosis and browning of needles (possibly normal leaf drop conditions for this species), and signs of historic logging (axe-cut stumps) were observed. Crown cover for both stands was approximately 25–30% for both the canopy and subcanopy trees. Foliar cover for shrubs in all layers, e.g., *Pinus aristata* saplings, *Ribes cereum*, *Dasiphora fruticosa*, and *Artemisia frigida*, averages less than 5% within a stand. Graminoids provide foliar cover of approximately 10%, with *Festuca arizonica*, *Danthonia parryi*, *Muhlenbergia montana*, and *Koeleria macrantha* the

most commonly observed species. A number of forb species are present within these stands, but the contribution to foliar cover is less than 5%. The most common forbs include *Besseyia plantaginea*, *Maianthemum stellatum*, *Geranium caespitosum*, and *Achillea millefolium*. Ground cover is predominantly herbaceous litter under one stand (85%) and small gravel and herbaceous litter under the other (55% and 35% respectively). Lichens are present, providing up to 10% ground cover.

The two stands of *Pinus aristata* / *Festuca arizonica* Woodland are relatively small, but are close to the project minimum mapping unit. Some signature confusion with dense ponderosa pine may occur with true color aerial photos; however, the location of both stands is known which will guide interpretation.

Global Vegetation: Stands have an open to moderately closed canopy typically 5-15 m tall that is solely dominated or codominated by the long-lived evergreen, needle-leaved tree *Pinus aristata*. Individual trees may reach 20 m. In some stands trees are clumped with grassy patches interspersed. Other tree species that may be present to codominant vary geographically within its range. *Picea engelmannii* and *Pseudotsuga menziesii* are the most common. *Picea pungens* is common in the southern extent where stands occur at high elevations, and *Pinus flexilis* has also been reported as an associate in some stands. *Abies lasiocarpa* and *Populus tremuloides* may be scattered in some stands, but are generally restricted to more mesic sites and are typically absent in the drier southern extent of this association.

The understory vegetation ranges from moderately dense to typically sparse because sites are dry and often have large amounts of rock cover. The sparse to moderately dense herbaceous layer often dominates the understory. The most common species are typically graminoids, especially species of *Festuca*. Common species may include *Calamagrostis purpurascens*, *Carex* spp., *Danthonia parryi*, *Festuca arizonica*, *Festuca brachyphylla*, *Festuca idahoensis*, *Festuca thurberi*, *Koeleria macrantha*, *Muhlenbergia filiculmis*, *Muhlenbergia montana*, *Poa fendleriana*, and *Trisetum spicatum*. Forbs are generally sparse, but *Trifolium dasyphyllum* may reach 10% cover. Other scattered forbs may include species of *Achillea*, *Antennaria*, *Artemisia*, *Arenaria*, *Arnica*, *Astragalus*, *Campanula*, *Erigeron*, *Hymenoxys*, *Penstemon*, *Polemonium*, *Sedum*, *Senecio*, and *Thalictrum*. This association differs from the *Pinus aristata* / *Trifolium dasyphyllum* Woodland [CEGL000762] by having a higher and more consistent cover of perennial grasses.

Global Dynamics: *Pinus aristata* is a slow-growing, extremely long-lived tree (Brunstein and Yamaguchi 1992). Several individuals over 2000 years old have been found in Colorado. DeVelice et al. (1986) observed that it occurs in open park-like stands and on steep rocky slopes where *Picea engelmannii* - *Abies lasiocarpa* stands are excluded by drought. Fire is important in the grass-dominated stands but is rarely intense enough to result in tree-killing crown fires (DeVelice et al. 1986). In some stands, suppression of grass fires has allowed encroachment of the trees into meadows (Larson and Moir 1987). Forage production is good in some stands, but rarely utilized by livestock because stands are steep and generally remote which makes access difficult.

Peet (1978b, 1981) noted that *Pinus aristata* is dominant at higher elevations in much of the southern Rocky Mountains, where *Pinus flexilis* is restricted to lower elevations. This is attributed to apparent competitive exclusion, because *Pinus flexilis* is dominant at high elevations in northern Colorado, Wyoming and Montana.

MOST ABUNDANT SPECIES

Florissant Fossil Beds NM

| <u>Stratum</u> | <u>Species</u> |
|----------------|--|
| Tree | <i>Pinus aristata</i> |
| Shrub | <i>Ribes cereum</i> |
| Graminoid | <i>Festuca arizonica</i> , <i>Danthonia parryi</i> |
| Forb | <i>Besseyia plantaginea</i> |

Global

| <u>Stratum</u> | <u>Species</u> |
|----------------|-----------------------|
| Tree | <i>Pinus aristata</i> |
| Shrub | <i>Ribes cereum</i> |
| Graminoid | <i>Festuca</i> spp. |

CHARACTERISTIC SPECIES

Florissant Fossil Beds NM

| <u>Stratum</u> | <u>Species</u> |
|----------------|---|
| Tree | <i>Pinus aristata</i> , <i>Pinus ponderosa</i> |
| Shrub | <i>Ribes cereum</i> , <i>Dasiphora fruticosa</i> , <i>Artemisia frigida</i> |
| Graminoid | <i>Festuca arizonica</i> , <i>Danthonia parryi</i> |

Forb *Besseyia plantaginea, Maianthemum stellatum*

**Global
Stratum**

Species

Tree *Pinus aristata*
Shrub *Ribes cereum*
Graminoid *Festuca* spp.

OTHER NOTEWORTHY SPECIES

Florissant Fossil Beds NM

Stratum

Species

Graminoid *Muhlenbergia montana*

**Global
Stratum**

Species

GLOBAL SIMILAR ASSOCIATIONS:

- *Pinus aristata* / *Trifolium dasyphyllum* Woodland [CEGL000762]

SYNONYMY:

- DRISCOLL FORMATION CODE:II.A.2.a. (Driscoll et al. 1984) B
- *Pinus aristata*/*Festuca arizonica* (Bourgeron and Engelking 1994) =

GLOBAL STATUS AND CLASSIFICATION COMMENTS

Global Conservation Status Rank: G4.

Global Classification Comments: This association differs from the *Pinus aristata* / *Trifolium dasyphyllum* Woodland [CEGL000762] by having a higher and more consistent cover of perennial grasses.

ELEMENT DISTRIBUTION

Florissant Fossil Beds NM Range: *Pinus aristata* / *Festuca arizonica* Woodland occurs as only two stands, one on the northwest-facing slope of Fossil Stump Hill and the other on the northwest-facing slope of the large hill east of the Visitor Center. A small clump (8 to 10 individuals) of *Pinus aristata* trees are present on the downstream portion of a livestock pond and dam, just south of Lower Twin Rocks Road. Individual *Pinus aristata* trees are occasionally observed in other woodland types within the monument, primarily on the large hill east of the Visitor Center.

Global Range: This association is known from the southern Rocky Mountains and from the Colorado Plateau regions of Colorado and New Mexico.

Nations: US

States/Provinces: CO NM

ELEMENT SOURCES

Florissant Fossil Beds NM Inventory Notes: Plots 24, 31

Classification Confidence: 2 **Identifier:** CEGL000759

REFERENCES: Bourgeron and Engelking 1994, Brunstein and Yamaguchi 1992, DeVelice 1983, DeVelice et al. 1986, Driscoll et al. 1984, Johnston 1987, Komarkova et al. 1988a, Larson and Moir 1987, Peet 1978b, Peet 1981, Shepherd 1975, Stewart 1940